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08/13/07 PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	Peter Williams EGOLF and Osmann SARI
Serial no.	:	10/536,855
Filed	:	with an effective filing date of November 28, 2003
For	:	METHOD AND DEVICE FOR MEASURING THE THERMAL CONDUCTIVITY OF A MULTIFUNCTIONAL FLUID
Group Art Unit	:	2859
Examiner	:	Mirellys JAGAN
Docket	:	NITROS P168US

The Commissioner or Patents
U.S. Patent & Trademark Office
P. O. Box 1450
Alexandria, VA 223 3-1450

RESPONSE

Dear Sir:

In response o the Examiner's proposed amendments of June 12, 2007, and the official action mailed July 12, 2007 including the notice of non-compliance, please enter the following before reconsiderat on of this application.

In the Claims:

Besides the cancellation of claim 19 and additional new claims 21-23 from the Applicant's response of March 12, 2007 the Applicant re-submits such claim amendments and new claims, including the Examiner's suggested amendments. Please enter the amended and new claims into the record of this case.

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1-10. (CANCELED)

11. (CURRENTLY AMENDED) A method for continuous measurement of thermal conductivity of a multi-functional fluid, the method comprising the steps of:

passing a sample of the multi-functional fluid through a space delimited by a first input face and a second exit face;

generating an increase in temperature of the sample of multi-functional fluid, at least by a very brief impulse of heat flux transmitted to the sample, through the first input face;

measuring the temperature increase in at least three separated points within the sample;

determining with the temperature increase measurement, an evolution of the multi-functional fluid temperature at the three points as a function of time;

determining thermodynamic characteristics of the sample of the multi-functional fluid as a function of the evolution; and

calculating a thermal conductivity of the sample <u>based on the determined evolution</u>.

12. (PREVIOUSLY PRESENTED) The method according to claim 11, further comprising the step of transmitting the impulses of heat flux in a repetitive manner; and

establishing a thermogram consisting of temperature evolution curves as a function of an amount of time between the transmitting the impulses of heat flux through the first input face and the evolution of temperature as determined at the three separated points within the sample.

13. (CURRENTLY AMENDED) The method according to claim 11, further comprising the step of deducing the thermal conductivity with the following equation:

$$\frac{\partial T}{\partial t} + \alpha(k)\left[\frac{1}{k}\cdot\frac{dk}{dT}\left(\frac{\partial T}{\partial x}\right)^2 + \frac{\partial^2 T}{\partial x^2}\right] = 0$$

where: T is the temperature;

k is the thermal conductivity dependent upon the temperature;

t is the time;

α is the thermal diffusivity dependant upon k and which is equal to:

$k(T)/\rho \cdot Cp$

with ρ and Cp being the volume mass and the specific heat and where x is the relative location of one of the three points.

14. (CURRENTLY AMENDED) A device for continuous measurement of thermal conductivity of a multi-functional fluid, the device comprising;

a means designed to pass a sample of the multi-functional fluid through a space delimited by a first input face and a second exit face of the sample;

a means for heating the sample to vary a temperature of the sample,

a means to measure variation of the temperature of the sample

a means to transmit to the sample, at least a very brief impulse of heat flux, through the first input face,

a means to measure a heat wave at three or more separate points within the sample;

a means to determine, on a basis of values measured, a temperature evolution of the multi-functional fluid as a function of time at the separate points within the sample;

a means to deduce, from the temperature evolution, thermodynamic characteristics of the sample of the multi-functional fluid; and

a means to calculate thermal conductivity of this sample[[;]], and;

~~the device for continuously measuring the thermal conductivity of the multi-functional fluid comprising the steps of:~~

~~passing the sample of the multi-functional fluid through the space delimited by the first input face and the second exit face;~~

~~generating the increase in temperature of the sample of the multi-functional fluid, at least by the very brief impulse of heat flux transmitted to the sample, through the first input face;~~

~~measuring the temperature increase in the at least three separated points within the sample~~

~~determining with the temperature increase measurement, the evolution of the multi-functional fluid temperature at the three points as a function of time;~~

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~~determining the thermodynamic characteristics of the sample of the said multi-functional fluid as a function of the evolution; and~~

~~calculating the thermal conductivity of the sample;~~

wherein the means to determine the temperature evolution of the multi-functional fluid as a function of time comprises at least three temperature probes (S1, S2, S3) designed to measure the temperature of the sample of the multi-functional fluid at the at least three separated points within the sample.

15. (PREVIOUSLY PRESENTED) The device according to claim 14, wherein the means to pass the sample of the multi-functional fluid through the space delimited by the first and second faces includes an enclosure (31) with an insulating lining (32) and an interior coating of polished metal (33), which is continuously traversed by the multi-functional fluid.

16. (PREVIOUSLY PRESENTED) The device according to claim 14, wherein the means (37) to transmit the at least one very brief impulse of the heat flux comprises at least one laser (40).

17. (PREVIOUSLY PRESENTED) Device according to claim 14,wherein the means to transmit the at least one very brief impulse of the heat flux comprises an emitter tube (21).

18. (PREVIOUSLY PRESENTED) The device according to claim 14, wherein the means to measure the heat wave which has traversed the sample comprises a receiver tube (22)

19. (CANCELED)

20. (CURRENTLY AMENDED) The device according to claim 14,wherein the means to deduce, from the temperature evolution at the three separate points in the sample of multi-functional fluid, the thermodynamic characteristics of the sample and to calculate the thermal conductivity compris[es] an arithmetic unit designed to receive from the temperature probes ~~(S1, S2, S3)~~, the signals corresponding to the values measured.

21. (NEW) A method for continuous measurement of thermal conductivity of a multi-functional fluid, the method comprising the steps of:

passing a sample of the multi-functional fluid through a space delimited by a first input face and a second exit face;

generating an increase in temperature of the sample of multi-functional fluid, at least by a very brief impulse of heat flux transmitted to the sample, through the first input face;

measuring the temperature increase with at least three temperature probes within the sample;

determining with the temperature increase measurement, an evolution of the multi-functional fluid temperature at the three temperature probes as a function of time;

determining thermodynamic characteristics of the sample of the multi-functional fluid as a function of the evolution; and

calculating a thermal conductivity of the sample.

22. (NEW) The method according to claim 21, further comprising the step of transmitting the impulses of heat flux in a repetitive manner; and

establishing a thermogram consisting of temperature evolution curves as a function of an amount of time between the transmitting the impulses of heat flux through the first input face and the evolution of temperature as determined at the three separated points within the sample.

23. (NEW) The method according to claim 21, further comprising the step of deducing the thermal conductivity with the following equation:

$$\frac{\partial T}{\partial t}+\alpha(k)\left[\frac{1}{k}\cdot\frac{dk}{dT}\left(\frac{\partial T}{\partial x}\right)^2+\frac{\partial^2 T}{\partial x^2}\right]=0$$

where: T is the temperature;

k is the thermal conductivity dependent upon the temperature;

t is the time;

α is the thermal diffusivity dependant upon k and which is equal to:

$k(T)/\rho \cdot Cp$

with ρ and Cp being the volume mass and the specific heat and where x is the relative location of one of the three separated points.